The Northwestern MILLER

MILLING PRODUCTION SECTION

A Preventive Maintenance Program

By Eugene J. Gehrig

The Quaker Oats Co.

Almost any technical trade magazine you may pick up will have one or two articles referring in some way to preventive maintenance. We, too, have been reading these articles, and we were impressed by the information contained in them. However, as so often happens, even though we felt the need for a maintenance program, we did not get started in such a program until we were forced to do so.

About three years ago in one of our plants, where all of the production employees in that plant belong to one union, and maintenance department people belong to another, our maintenance people decided they should strike. The management of the plant called in all of the production supervisors, and advised them that on the next day, that plant would have to operate without any maintenance people, but the plant would start as usual as the members of the production union had agreed to work, and had further agreed to go through any picket lines that maintenance union people might establish.

This was a serious situation for this plant to face because if anything happened to any of the machines, it would mean that the unit would be out of operation for the duration of the strike. It was decided at this meeting that the production supervisors would go back to their people, and ask them to keep a careful watch on their machinery, and to advise them of anything irregular about the machines so that it could be fixed before a major breakdown occurred. The management of this plant fully expected that if the strike of the maintenance people continued for any length of time, gradually one by one our various units would be put out of production because of lack of maintenance.

This strike continued for eight weeks. During that time our production people watched their machines very carefully, keeping them well oiled and well cleaned, advised their supervisors of any small fault in their machines so that the supervisors could do the minor maintenance jobs that were absolutely necessary to keep the machines running. With this splendid cooperation, this plant was able to operate the entire eight weeks without the loss of a single unit.

Program Requested

At the conclusion of the strike the plant management was so impressed with the job of preventive maintenance done by their people during the strike, that they requested our central engineering department to develop a preventive maintenance program so that they could receive the benefits of preventive maintenance at all times.

After this very striking example, and other experiences we diligently searched all magazines for articles on preventive maintenance systems and we visited many companies which had preventive maintenance programs to ask their advice and to seek first-hand knowledge of how to operate a preventive maintenance program. So you see, we are not the originators of such a program. Even the forms we use on the preventive maintenance program are not original with us.

From this study we learned that all preventive maintenance programs have the following objectives:

(1) To reduce maintenance costs.

(2) To reduce production losses.

(3) To promote better management of maintenance department through scheduling and planning of maintenance work.

(4) To develop a maintenance history of each machinery unit.

Policies Set

After we learned the objectives of all preventive miantenance systems, we decided to set certain policies on which to base our own program. These policies were:

(1) Our own system must be as simple as possible.

(2) Our system must require as little clerical work as possible.

(3) Our system must leave the responsibility of operating the department and maintaining the machinery with the department manager.

(4) Our system must locate all records in one central location.

EDITOR'S NOTE: A good preventive maintenance program can be a very important part of grain processing operations. In the accompanying article, Eugene J. Gehrig describes the program now being followed by the Quaker Oats Co. in all of its plants. The article is from a talk by Mr. Gehrig at a meeting of the Grain Processing Machinery Manufacturers Assn. Mr. Gehrig is in Quaker Oats' engineering and planning department, in charge of mill design and installation.

(5) Our system must fit in with all other programs now in use in our plants.

(6) Our system must be suitable for plants having 50 employees with two maintenance men and be flexible enough to be satisfactory in plants having 1,200 employees with 150 maintenance men.

(7) Our system must develop historical information on each individual unit so that this information can be used in our future selection of ma-

(Continued on page 21a)

The Quaker Oats Company

INSPECTION DATE RECORD

Unit No._____ Location_____ Fl._____

Inspection Period_____ Mach._____

Inspection Period	Inspected	Inspection Period	Inspected

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UNIT RECORD CARD

UNIT. NO._____ MACHINE_____

DATE	JOB NO.	DESCRIPTION	MATERIAL	LABOR	TOTAL

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Grain Storage Problems

• • •

By Leo B. Holman

U.S. Department of Agriculture

EDITOR'S NOTE: Some grain storage problems and possible solutions to them are covered in the accompanying article by Leo E. Holman, Transportation and Facilities Branch, U.S. Department of Agriculture. He deals in part with country elevators, but his report relates to all grain storage. Most of his remarks have to do with mechanical aeration of grain and possible extension of the practice. The article is from a talk by Mr. Holman at the National Grain Sanitation Conference in Kansas City.

v v

The country elevator performs an important function in the movement of large volumes of wheat and other grains from the farm to the ultimate market. Elevators in the wheat country provide concentration points for wheat as it moves from the farm to terminal elevators or to millers. Wheat is received from farms, stored, conditioned when needed, then loaded out for shipment.

There are certain structural problems connected with grain storages that are not common to other types of buildings, and more grain elevators fail from a construction standpoint than any other specialized buildings. The walls and floor must be able to support the vertical load exerted by the grain, and the walls must be strong enough to resist the outward pressure of the grain. Country elevators are generally tall structures and must withstand high winds when empty. Machinery for operation must be placed and supported wherever required for the best operation. One of the main functions of any grain storage is to protect the stored grain against external moisture. Therefore walls and roofs must be weathertight at all times to prevent entrance of moisture.

Elevators should also provide adequate protection against the attack of insects and rodents. Most insect pests of cereal products seek dark places in which to hide. Adequate light and ventilation in tight, easy-to-clean structures will help to control these pests. The construction of rodent-proof storages is the most inexpensive type of rodent control. When this is not done, the problem is enhanced. However, much benefit can be obtained by inexpensive structural additions and repairs which will help in preventing the entrance of rats and mice.

Modern harvesting and transportation methods have often added to the problems of the country elevator. The combine has speeded up the harvest season for wheat and other small grains. When the combines start, grain is harvested rapidly and large speedy motor trucks can move it rapidly into storage. Older elevators may not be equipped to handle large volumes of grain in such a short period of time. The capacity of all mechanical equipment may not be coordinated for the fastest movement of grain through the elevator. The equipment with the lowest ca-

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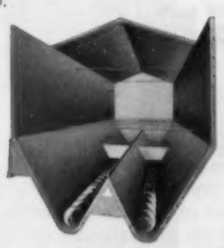

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pacity becomes a bottleneck in the handling of grain.

The use of combines often presents another problem. Formerly grain stood in the shock or stack for some time and natural drying generally reduced the grain moisture content to a level safe for storage. With the combine the grain is harvested and threshed in one operation. As a result, the grain often reaches the elevator with a moisture content too high for safe storage.

It is known from research and experience that temperature and moisture content of grain are two of the most important factors in safe storage. The maximum moisture content for the safe storage of wheat for a year is generally considered to be from 13 to 14%. However, this safe level may vary considerably with variations in temperature and other conditions. In colder climates or during the winter months grain with a higher moisture content may be safely stored; with higher temperatures the safe moisture level is lowered.

To maintain or improve grain quality, adequate conditioning methods are required when grain too damp or warm for safe storage is received.

Damp grain may be artificially dried to a safe level prior to storing if drying facilities are available. Recommended drying air temperatures and air flow rates should be used to avoid grain damage such as loss of germination, scorching, "case hardening" of kernels, reduction in baking quality, checking of kernels, and molding, which may occur if the drying process is prolonged.

High temperatures in stored grain encourage mold growth, insect activity, and other storage difficulties; and such grain should be cooled by turning or by other methods.

One of the problems connected with the storage of grain in large bulks is the fact that moisture from warmer grain will move into colder grain and moisture from damp grain will move into drier grain.

Low Conductivity

Grain stored in bulk has a low conductivity (1/6 to 1/10 that of concrete) so that outside temperature fluctuations have little effect on grain that is more than 1 to 2 ft. from the bin walls. Therefore, temperature differences show up within a grain mass during the fall and winter where grain is stored in large bulks. Grain near the bin wall and surface cools faster than grain in the bin interior. The difference in grain temperatures is responsible for convection currents which move downward through the cooler grain near the bin walls and upward through the warmer grain at the bin center.

There is a slow but continuous exchange of moisture from the warmer to the cooler grain due to differences in vapor pressure. This moisture tends to move upward because of the effect of the rising convection currents taking place within the central portion of the grain bulks. As the warmer, moist air reaches the cooler grain near the surface, condensation generally takes place to a degree depending upon the conditions of the grain and the atmosphere. Some molding and caking of the surface grain often accompanies this accumulation of moisture.

The relation of temperature differences, convection currents, and moisture migration in stored grain was clearly demonstrated in an experiment conducted at Ames, Iowa, in 1943-44, in a 2,740-bu. circular metal bin of shelled corn. Other investigations have provided proof that moisture migration also occurs in stored soybeans, wheat, and other grains and that it is more pronounced as the size of the bin increases.

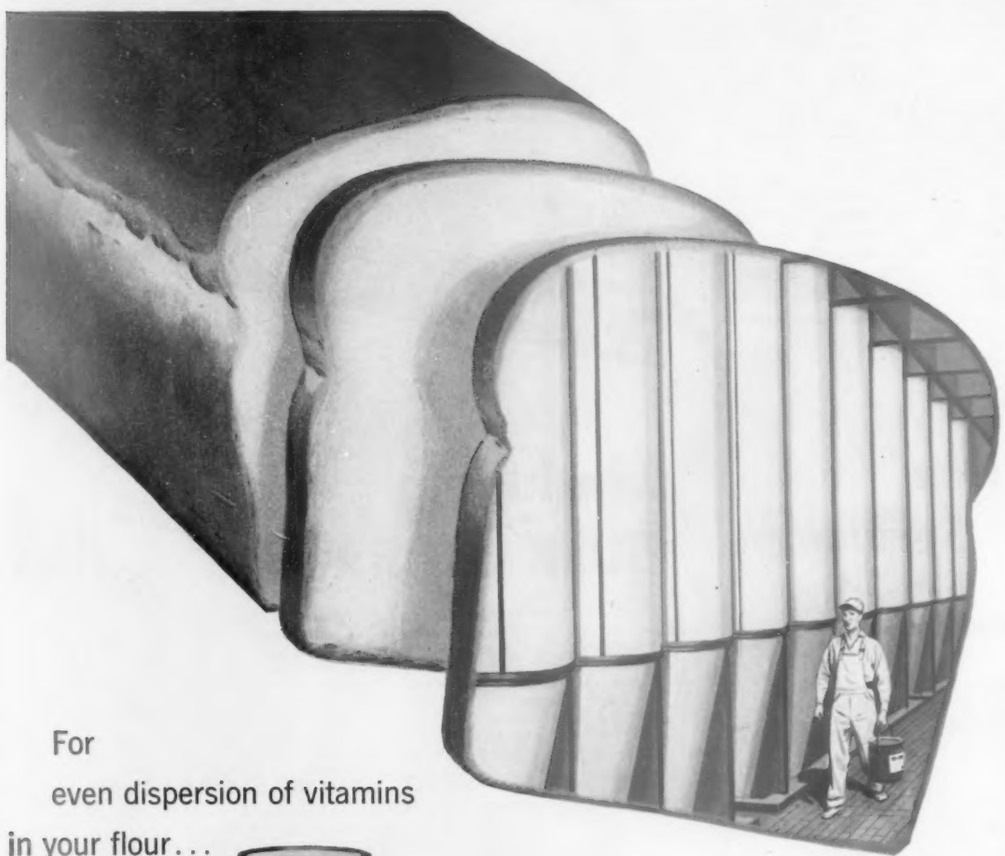
Mechanical Aeration

Studies made on grain stored at government-owned bin sites have demonstrated that mechanical aeration of stored grain is effective and practical for maintaining the condition of grain stored with moisture contents within the recommended ranges. For the purpose of this discussion aeration is defined as "the circulation of small volumes of cool, atmospheric air through stored grain for the purpose of cooling the grain to prevent moisture migration and to minimize microflora and insect activity." Aeration is different from drying with unheated air in that air flow rates for aeration are less than 1 cu. ft. of air per minute per bushel. In contrast, rates for drying with atmospheric air ranges from 1 cu. ft. per minute per bushel upward to 10 cu. ft. per minute, or higher.

Aeration as defined here is not intended as a method of drying grain—in fact it may increase the grain moisture at times. Aeration is a method of cooling the grain to equalize the temperatures of a grain mass and thus eliminate the convection currents which cause moisture migration and subsequent moisture accumulations.

When high moisture accumulations are prevented, caking and molding of surface grain is minimized. This also minimizes to some extent any insect activity in these areas.

In aerating stored grain, fans or blowers have generally been operated to draw the air downward



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through the grain. This is done for two reasons: (1) It tends to offset the natural tendency of the convection of currents to move upward from the warm grain toward the cool upper surface; and (2) the exhaust air, which is generally comparatively warm and moist, is expelled through warm grain in the lower part of the bin and not through the colder upper grain surface where some condensation might occur.

In 1949, fans for aerating stored grain were installed in government-owned, flat-type storage buildings holding from 20,000 to 40,000 bu., since no facilities were available for "turning" the grain economically. The fans circulated at least 0.1 cu. ft. per minute per bushel through the grain. A ¾ to 1½ horsepower electric motor provided sufficient power for operating the fan, which was connected to a central perforated floor duct. Air was drawn through the grain, into the duct, and exhausted through the fan. The time required to cool the grain to a comparatively uniform and cool temperature ranged from 3 to 10 days. This time varied because of atmospheric conditions, size of aeration unit, and the initial temperature of the grain.

A comparison was made between the moisture content of the surface layers in similar aerated and non-aerated storages. In storages aerated during October and November the moisture content of the surface grain increased only from about 12.5% up to nearly 15.5%. In the non-aerated storages surface moistures increased from about 12.5% to above 25.5%, and considerable damage resulted from the high moisture content.

Ship Storage

Early in 1953 the Commodity Credit Corp. arranged to store government - owned surplus wheat in 75 inactive Liberty ships in the Hudson River Reserve Fleet above New York City and in 50 similar ships in the James River Reserve Fleet above Norfolk, Va. Prior to loading the ships, the Commodity Credit Corp. requested help in designing aeration equipment that could be used in cooling and equalizing temperatures of the grain stored in the ships.

Several problems were encountered in designing, installing and operating the aeration units. There was no power source abroad the ships and no central power source readily available. Therefore, it was necessary to use portable generators which supplied 440-volt, A.C., 3-phase current. It was necessary to use small fans and motors because of the limited power available.

Fans were provided that delivered about 1,000 cfm at a suction pressure of 1-in. water column and required an electrical input to the motor of about 325 watts. These small units were able to circulate only about 1/30 to 1/40 cu. ft. of air per bushel through the stored wheat which was over 20 ft. deep in some of the ship holds. Six fans were provided for each ship, two for the largest (No. 2) hold and one each for the other four holds, giving a total of 450 fans and motors for the Hudson fleet and 300 fans for the James River fleet.

The two lines of 8-in. perforated tubes were laid lengthwise on the bottom deck of each hold to provide ducts for circulating air through the wheat. The two lines were placed 8 ft. each way from the center line of the hold. The widths of the holds ranged up to 56 ft. and the depth was around 20 ft.

Wheat was stored in five holds of each ship, each hold ranging in capacity from 20,000 up to 75,000 bu. The amount of wheat stored in each ship averaged about 225,000 bu. with a total of slightly over 17 million bushels at the Hudson River Fleet and somewhat over 11 million bushels at the James River Fleet.

Some of the wheat was loaded into ships in late April, but most of it was loaded during the summer months. Therefore, the temperature of much of the wheat at both fleets was above 75° F. when stored, with

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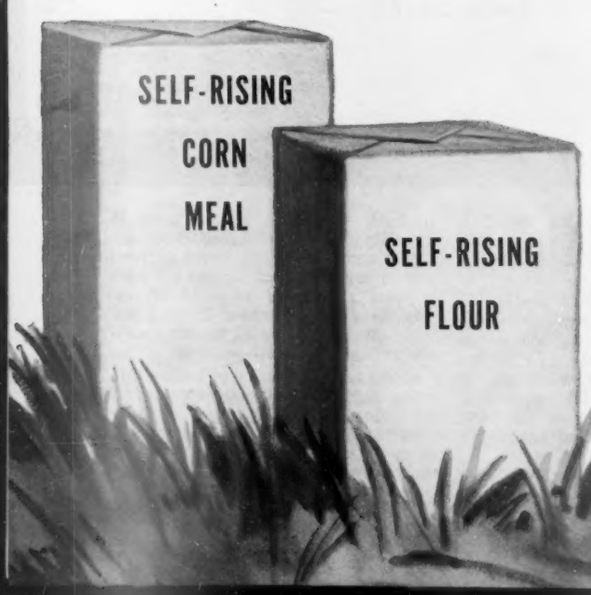

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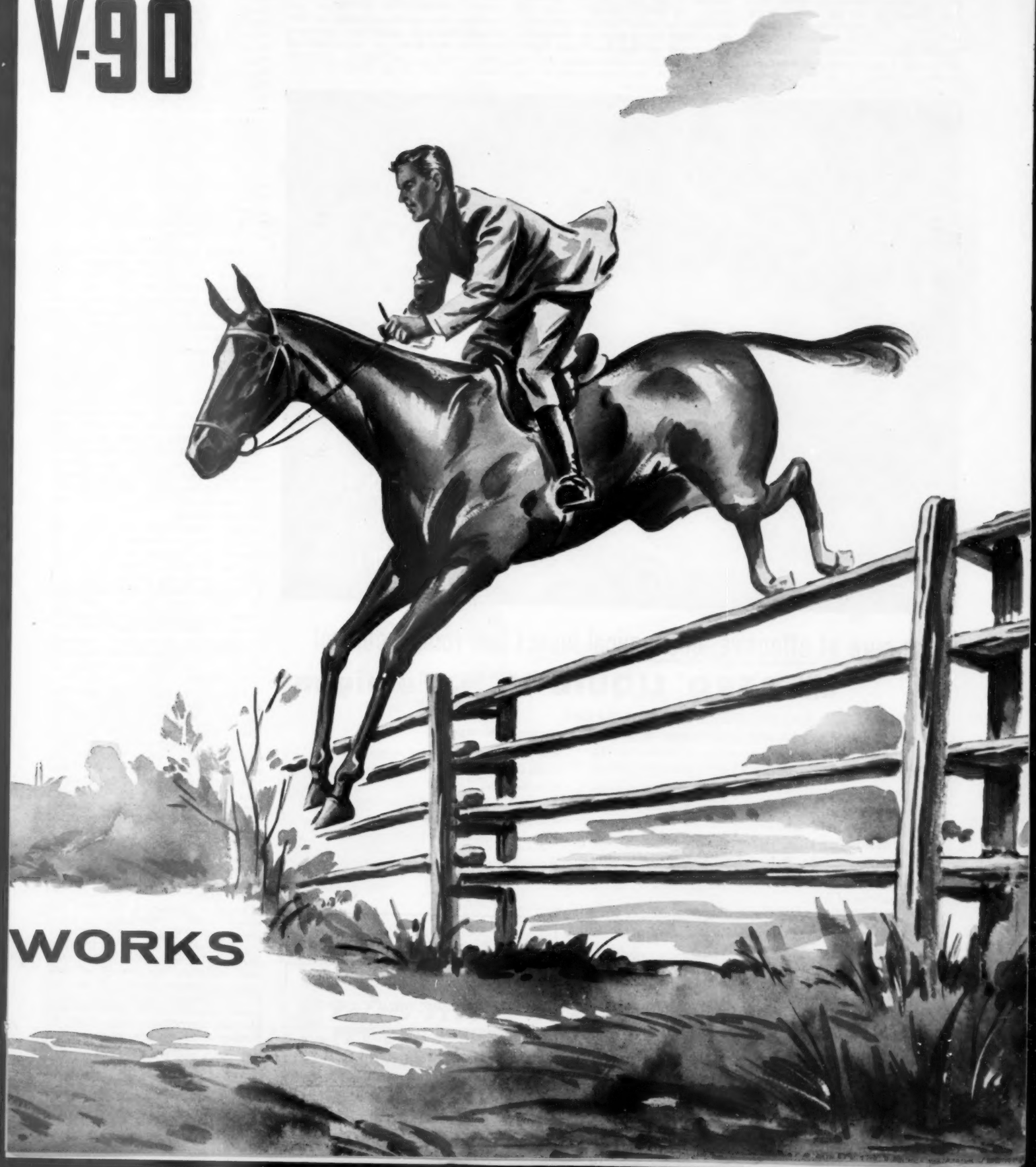

WORKS

temperatures as high as 85° to 95° F. in many of the ships. Much of the wheat in the central area of a nonaerated hold cooled very slowly even during the winter months. At the same time the outer layers of wheat cooled quickly with cold air above the wheat and cold water around it. Where the warm wheat was not aerated, convection currents developed that caused moisture migration within the wheat bulk. This was illustrated in one ship loaded in August 1953 with wheat having an average moisture content of 12%. Wheat samples taken in January 1954 showed the following moistures: Surface, 13.8%; 16 to 24 in. below surface, 12.5%; 40 to 48 in. below surface, 11.9%.

The wheat temperature near the surface at that time was 37° F. while that in the center of the bulk was 77° F. This wheat was cooled by aeration, eliminating convection currents and preventing moisture migration.

It was obvious that the small fans delivering only 1/30 to 1/40 cfm per bushel would have to be operated for a long period during cool or cold weather in order to cool the grain down near the outside air temperature. Most of the fans were operated from 800 to 1,000 hours; and by April 1, 1954, the temperature of the wheat in most ships was considered to be low enough for safe summer storage. By that time much of the wheat in the Hudson River Fleet had temperatures below 45° F., and wheat in the James River Fleet had temperatures below 50° F. About 0.9 kilowatt-hours of electricity per 100 bu. of wheat were used in aerating the stored wheat during the fall and winter of 1953 and 1954.

Commercial Storage

From the results obtained to date in circular bins, large "flat" storages and in ship storages, it is believed that similar mechanical aeration practices can be beneficial in country elevators and other commercial storages. Research is now being initiated by the Handling and Facilities Research Section to learn whether mechanical aeration in commercial storages, both silo and "flat" types, is beneficial and practical.

Operators of conventional silo-type country and terminal elevators "turn" the grain periodically from one bin to another when grain is stored for more than a few weeks. Turning is generally done during cold weather to cool the grain or at least equalize grain temperatures, to break up localized trouble spots in the grain mass, and to inspect the condition of the grain visually. During the short time that grain is exposed to the air during turning, the grain temperature usually is reduced only 6 or 7 degrees in the coldest weather. Repeated turnings are necessary to accomplish the effective cooling of warm grain. It is believed that grain can be cooled as well, or better, with aeration systems using cool, atmospheric air. Cool air is passed through the grain rather than the grain being passed through the cool air, as in turning.

Elevator operators have shown an interest in "flat" type storages, i.e., storages that have a large floor area and walls only up to 20 ft. high. To date, such storages have been used mainly to provide additional storage space in connection with conventional country elevators. A few complete installations using this type of building have been made. It is difficult to "turn" grain from one flat storage to another. However, mechanical aeration has been used successfully in such storages for cooling the grain to control moisture migration and to retard insect activity and mold development. Grain has been stored successfully for a year and longer without "turning" in government-owned flat storages where mechanical aeration facilities have been provided and used.

"Sick" wheat has been a periodic problem for a number of years in this country. It gives no sign of heating and is characterized by a dull, lifeless appearance of the grains and a dark color of the germ. The cause of "sick" wheat is not definitely known, but several workers suggest it may be due to insufficient aeration. It is hoped to determine if mechanical aeration will have any beneficial effect in controlling the amount of "sick" wheat.

A number of commercial operators are interested in mechanical aeration if it will minimize turning of stored grain and help to maintain the grain in good condition. A number of systems will be tested in several states. For example, in Iowa tests will be conducted in silo-type bins holding 30,000 bu. of shelled corn. An estimated air-flow rate of 0.1 cfm per bushel will be circulated through grain depths up to 100 feet with a 7½- to 10-horsepower electric motor. The estimated pressure drop through the grain, under the conditions stated above, is about 10 inches, water gage.

Another example is an Ohio test where 60,000 bu. of wheat is being aerated in a tank 150 ft. in height. An air-flow rate of 1/30 to 1/40 cfm per bushel is being used. A 7½-horsepower electric motor and a high-pressure blower capable of working against pressures up to 12 in., water gage, supplies this air-flow rate through the wheat depth of 150 ft. Similar aeration tests are being conducted in country and terminal elevators, with soft wheat in Indiana, and with hard winter wheat in Kan-

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sas. Similar studies with other grains and seeds are being conducted in Georgia and Texas.

Study Results Awaited

Results from these studies will indicate whether aeration can be used to advantage in conditioning grain in commercial storages and in eliminating at least some of the turning or transferring of grain from bin to bin, as now practiced. Information is needed about the following: Optimum air temperatures and relative humidity for aeration to prevent excessive drying or wetting of the stored grain, optimum air-flow rates for achieving satisfactory results with the lowest equipment and operating costs, and the most satisfactory duct systems for uniform air flow through the grain.

Adequate temperature-measuring systems will be required to observe the temperature patterns in the stored grain if the grain is not to be turned for long periods. Many operators do not entirely trust temperature records but depend mainly on visual inspection. However, the risk of losses is reduced if the grain is cool, but temperature systems are needed to determine that the stored grain remains cool.

Airtight Bins

Suggestions have been made that grain should be stored in airtight bins rather than in conventional bins. Advocates of airtight storage point out that the accumulation of carbon dioxide produced by respiration of the grain and the depletion of oxygen may be advantageous. Under these conditions, the entrance and survival of insects would be prevented and heating would not occur.

While airtight storages may have several advantages, there are also disadvantages. Anaerobic respiration soon produces dead grain, which deteriorates more rapidly than viable grain. It is doubtful if airtight storage could ever be recommended for the storage of high-moisture grain for commercial use.

Incoming Materials Checks Important In Sanitation Work

One point in the sanitation program of a food plant that is vulnerable to frequent breakdown is the contamination of the plant or products through receipt of contaminated incoming materials, according to Glenn O. Munger of the Industrial Fumigant Co., Kansas City.

Mr. Munger, in a sanitation service letter, exp'ained that these materials may be raw materials and supplies for the manufacturing process, or at times, returned products. All plants face this problem at one time or another.

Mr. Munger went on to say:

Contamination of the plant from this source is a continuous hazard as new materials and products are constantly being received and brought into the plant. Contamination of these products by insects is quite common and we will speak of insect infestation in this discussion. Insects, then, have an oportunity for rather rapid spread throughout the plant when they are introduced by this means. The incoming ingredients are generally put to use fairly soon throughout the plant. Many times there are items that are taken directly to the location where they will be used upon their receipt in the plant.

When incoming goods are distributed directly to the place of use in the plant, any resulting infestation that may occur may be difficult to trace. When a problem of sanitation appears in such a location, it is usually necessary to check all possible sources to find the source of the problem. As a result, some time may be lost, as well as facing the possibility of the contamination of other products present in the area. Control measures that may become necessary under these circumstances become many times as extensive as compared to those needed had the problem been found before the product was distributed in the plant.

Two-Fold Problem

Incoming goods are sometimes stored in the same warehouses as finished goods awaiting shipment. A serious problem is found in this instance in that the finished products are exposed to contamination and the resulting spread of the problem may not be discovered until a customer complaint is received. The problem becomes two-fold — contaminated products in the warehouse and customer dissatisfaction.

Here then, are two possible problems that may arise from the receipt of goods that arrive in an infested condition. On one hand, the manufacturing areas become subject to the infestation, or on the other hand, the storage sections for the finished prod-

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ucts may be infested. Insect infestation in either location presents difficult problems and the control measures needed to control any infestations in these areas may take considerable time and expense. It is difficult to say which of the problems would be the worst, as both conditions are highly undesirable.

One may ask, "How could an infested batch of material be taken into a plant and either stored or distributed without someone taking notice of the fact?" This is entirely possible as it is not uncommon to find the infestation well hidden in the product, or that the people actually bringing the material into the plant do not pay close enough attention to the load to notice the infestation.

The source of the contamination of the incoming product may be determined in a number of instances. This point should also be investigated while control measures are being taken. The product may have been in an infested condition when it was loaded for shipment by the supplier, or it could have been contaminated in transit. The two sources may be difficult to pin down and separate at times, but a little investigation will many times bring out the answer. Here again, one may question the value of making this particular determination. The value lies in the possibility of getting to the root of the trouble, and although a problem is at hand that must be dealt with immediately, a solution to future problems may be found and steps taken to prevent the same thing happening again.

The immediate problem, however, is how to take care of the contamination and prevent it from spreading further in the plant. Control or remedial measures must be started to stamp out the contaminating factor. These control measures should be taken as soon as possible following the discovery of the fact that the product in question is contaminated.

This, of course, enables the plant people to confine the contamination in as small an area as possible and the resulting control measures are less involved, both in time and expense.

A good policy to follow is to have all incoming or returned goods inspected prior to unloading. Returned goods are to be suspected immediately since they were sent back to the plant for some reason or another. If product contamination is the reason for the return, there is no doubt that control measures should be taken immediately upon receipt of the goods. Incoming materials other than returned goods may be free from any contamination or they may not. Inspection will determine if it is safe to receive these materials in the plant.

Should an inspection show the presence of insect infestation, the entire load should, and can be treated immediately before unloading. Fumigation of the product in the boxcar or trailer is successful if the condition of the carrier is such that it can be fumigated. The type of fumigation and the fumigant used will depend on what products are involved. For example, bulk loaded materials sometimes must be treated differently than material packed in bags. Many plants have installed fumigation chambers in locations where such goods may be treated as they are unloaded and before they are allowed in the plant. In either case, this method of control involves much less effort and expense than control measures that may be necessary following the spread of the infested goods in the plant.

Another method of handling the problem would be the rejection of the product in question. This course of action depends on the policies of the plant under these circumstances.

The program of checking on the condition of the incoming shipments may vary according to the plant and to the amounts of material usually received. A program of inspection should be in effect that is geared to the needs of the individual plant. These programs may include a complete inspection and sampling of the product by plant personnel and also the procedure of having advance samples from the supplier.

Along with the inspection procedure, control methods should be at hand in case the inspection shows the need for them.

This close watch on incoming goods may be of great value and the sanitation program will benefit a great deal through the detection and rapid control of potential plant-wide contamination.

—BREAD IS THE STAFF OF LIFE—

Russell-Miller Begins Employee Publication

MINNEAPOLIS—Some 1,700 employees of Russell-Miller Milling Co. in 31 states recently received their first copies of the company's new monthly publication, the Grainville Bugle. A staff of 41 reporters at all major company locations has been set up to facilitate news coverage, John F. Near, public relations director, said.

CONTENTS . . . FIVE (5) U. S. GALLONS
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Problems of Sampling

EDITOR'S NOTE: The following article deals with sampling problems as they relate to flour and feed milling. The article is from the British journal "Milling."

In most industries the manufacturer relies upon the service of the laboratory for guidance in the selection and processing of his raw materials and for supervision of the quality of his finished products.

The flour miller and the feed miller are no exceptions; the former depends upon advance information about the chemical and physical characteristics of his wheats and has his final product, flour, regularly tested in the laboratory and bakery, while the latter utilizes analytical data in compounding his balanced rations and then has the nutritional value of these rations checked by the chemist.

The trend of progress in both industries has made the services of the analyst more than ever necessary and has extended the scope of his activities. Both the flour miller and the feed miller are becoming accustomed to incorporate in their finished products what may be described as trace quantities of substances that have a pronounced influence upon nutrition, such as, vitamins in flour and antibiotics in balanced rations, and the determination of the overall concentration and distribution of these additives is a task for the chemist.

Reliability

If the miller is to be able to utilize the data furnished by the laboratory to formulate his blends and to perform his manufacturing operations so as to arrive at a desired standard of quality in his final products, then those data must be reliable. In other words, if the laboratory reports that the protein content of a consignment of wheat is 12%, or the oil content of a consignment of palm kernel meal is 10 per cent, then the wheat or the palm kernel meal going into the miller's blend must have that composition. This position is not necessarily arrived at, however, by the chemist insuring that he has performed an accurate analysis. It is equally essential that the material which the chemist submits to his analytical operations is representative of the bulk consignment. Hence, the usefulness of an analytical figure reported by the laboratory is related to the degree to which the portion of the material actually analyzed is a true sample of the whole.

The sample submitted to the analyst is usually extremely small compared with the bulk consignment which it represents—it may be one fifty-thousandth or less of the whole. If the material involved were quite uniform in composition and in particle size, then the ratio of the size of the sample to the size of the bulk would be of little moment, but so often the material is not uniform in either composition or in particle size. The greater the lack of uniformity in the bulk, the larger should be the sample drawn from it. It is not sufficient, however, merely to withdraw a greater quantity of material in one operation. The withdrawn sample should consist of a mixture of a number of smaller samples taken from well distributed sites in the bulk. The total sample abstracted need not be sent to the laboratory but when only a portion of it is to be submitted, it must not be from the larger initial sample until the latter has been very thoroughly mixed. If the material is significantly variable in composition and irregular in particle size, then it must be ground before any sub-sampling is attempted. Initial samples and sub-samples must be so protected that they cannot undergo any change in composition before they are analyzed.

Analytical Data

With the foregoing points in mind, let us review some of the analytical data upon which the flour miller and the feed miller rely for guidance. The analysis of advance samples of wheat provides a good illustration of some of the difficulties we have mentioned. Some wheats are a mixture of red kernels and "yellow grains," and as the latter are often significantly lower in protein content than the former, a small sample will furnish a reliable figure for the protein content of the bulk only if the proportion of "yellow grains" it contains agrees with that relating to the whole consignment. In one small sample the relative proportions of the two types of kernel might be anomalous, but if a number of samples are taken and bulked, the discrepancy should not

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It's a stronger, more streamlined, more compact mill. A Buhler 10" x 40" mill occupies the same space as a conventional 9" x 36"— provides 10% more capacity in the same floor area.

The "*Buhler*" is infestation-proof — no spots for insects to breed. High quality rolls insure even grinding, higher extraction, and greater capacity. Simple, uniform, double-roll UNIC feeder is automatic. Feed rolls and grinding rolls are interlocked.

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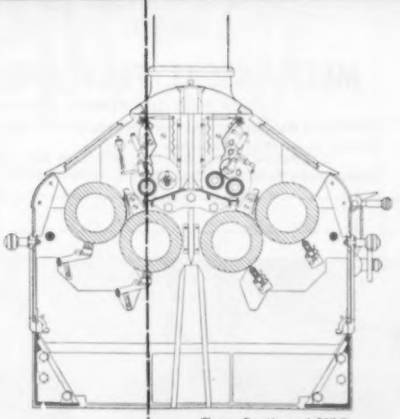

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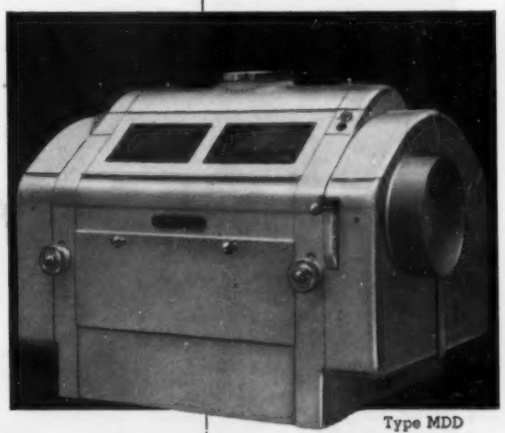

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be great; the greater the number of small samples taken, the more truly representative will the total mixed sample be.

Another difficulty may arise with wheats which contain a proportion of very thin kernels, such as, for example, the lower grade Manitobas, particularly in some seasons. During transport by ship some segregation of the grains may take place, with the result that upon arrival the shipment is far from being uniform throughout its bulk. When cargoes of such wheats are being assessed, it would be dangerous to make use of an opening sample; the grain at the top of a hold might give very different results from the remainder of the cargo. An opening sample can be used when the wheat is uniform in nature but when time permits, the analysis should await the preparation of the "average sample." This is obtained by taking samples periodically as the wheat is being discharged and then bulking these samples.

When wheat is being tested, the question of sampling errors arise also during the treatment of the material in the laboratory. It is customary to perform both the moisture and the protein determinations on ground wheat, but it is not practicable to grind the aliquot after it has been weighed. In adopting the alternative procedure of grinding some of the wheat and then weighing out the necessary aliquot, care must be taken to insure that the aliquot contains the correct proportions of endosperm and branny skins; if the relative proportions were seriously at fault, the result of the protein determination would be incorrect. The grinding should be performed, therefore, in such a manner that there is not a marked disparity between the particle sizes of the endosperm and the skins in the ground material.

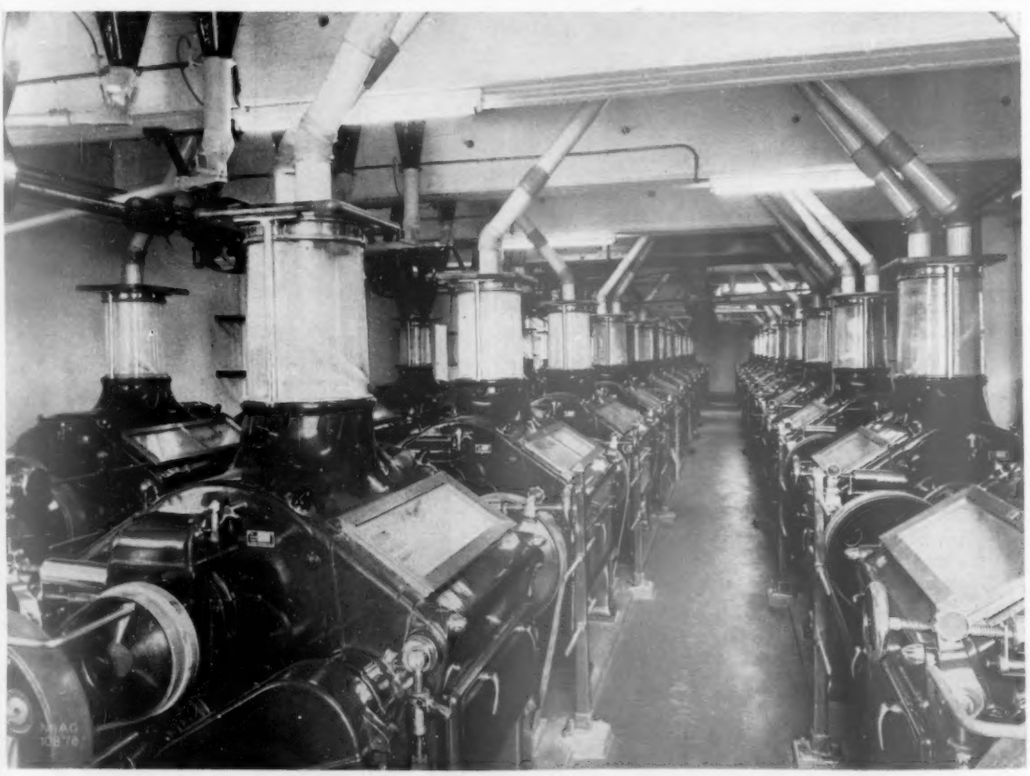
Flour which contains no mineral additives presents no sampling difficulties because of its fine particle size and the very thorough mixing it receives in the mill before reaching the packer. When additives are present, however, the problem of uniformity of distribution arises. Irregular distribution could arise either because the additive was present in only a very small proportion and was perhaps added at a later stage of the milling process or because the physical properties of the additive did not lend themselves to easy distribution of the substance thoughout flour. The properties of creta come within this category and hence while 140 lb. of flour may contain the required 7 oz. of creta, the proportion of creta in a 5 gram sub-sample taken for analysis may be very different from this.

Feed Industry Example

An example from the feed industry of the importance of correct sampling is found in the determination of the antibiotic content of a ration. The use of antibiotics as growth factors in animal feeding calls for the addition of as little as 4 grams of antibiotic to one ton of ration, i.e., 4 parts per million, from which it is obvious that sampling must be very thoroughly and carefully performed if the analysis of only 20 grams of material is to be a reliable index of the amount of antibiotic in, say, one ton of the ration.

Another feed sampling problem, but one which concerns the analyst, relates to the determination of the fibre content of a coarse ration in which a fibrous constituent is present in fairly large pieces. It would

(Continued on page 17a)



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Most grain at harvest time is weevil and insect free. The problem that faces the farmer and the commercial storage man is to *keep* it that way. When insects or weevils attack grain that is in storage, it is then necessary to fumigate if you are to prevent additional loss of grain and even complete destruction. Unfortunately, even when you fumigate at first signs of infestation, you have already lost money, for when there are enough insects to see, there are already enough to have done damage.

The solution? A liquid grain protectant *powerful* enough, *long lasting* enough and yet, *economical* enough to be applied when the clean grain first goes into storage so that the grain will remain insect free and undamaged during the normal storage period.

TETRAKOTE is that liquid protectant.

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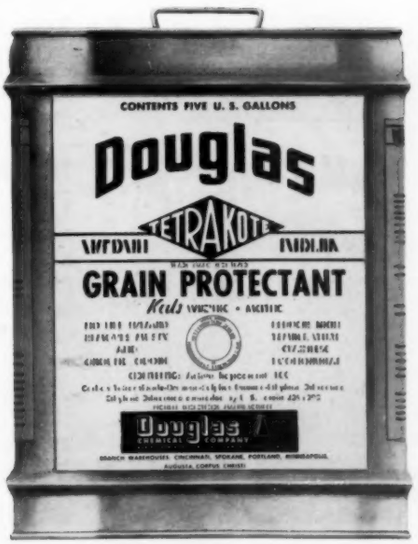

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Douglas TETRAKOTE is a liquid grain protectant that is applied to the grain as it is placed in storage. Previous methods of grain protection were based on fumigating the grain mass *after* the grain was in storage and *after* destructive insects had had a chance to infest and damage the grain. With Douglas TETRAKOTE that chance is eliminated! The residual, protective coating provided by TETRAKOTE provides positive protection against insect damage for periods up to 12 months when applied according to directions.

Here is Good News Concerning Costs!

In a period of from 8 to 12 months, insects may cause damage to stored grain amounting to 70c or $1.00 per bushel (those are conservative estimates) if the grain is unprotected. The average cost of applying TETRAKOTE is less than 2c per bushel. Therefore, you can't afford to leave your stored grain unprotected . . . you can't afford *not* to use TETRAKOTE! Just think of it—with one application of TETRAKOTE, you save far more than enough to pay for the protectant. Two gallons of TETRAKOTE will treat approximately 1,000 bushels of grain, depending on kernel size.

TETRAKOTE Stays On!

Turn it! Move it! Ship it! TETRAKOTE, being a residual spray, is especially formulated to stay on the grain during normal handling. TETRAKOTE was developed and is recommended for grain that is to be in storage for more than 6 months. The protective coating is effective for up to 12 months. TETRAKOTE also contains a fumigating material that gives an extra killing punch to infested grain being treated.

TETRAKOTE Is Safe to Use!

The powerful insect killer in TETRAKOTE is harmless (when used as directed) to the milling, eating and germination qualities of the grain. The TETRAKOTE patented formula is approved for application directly on the grains and seeds.

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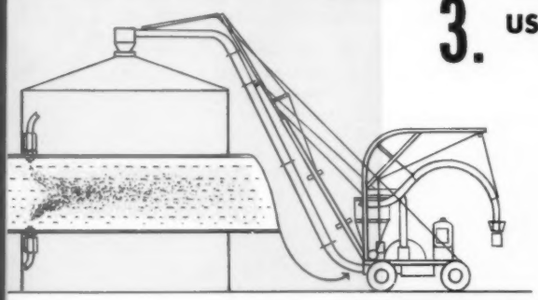
TETRAKOTE can be applied quickly, easily three ways

1. APPLY BY HAND (For On-the-Farm Use)

Douglas TETRAKOTE may be applied by hand at the time of harvest by the farmer. For this type of application, it is recommended that the TETRAKOTE be applied with a Douglas sprayer or other sprayer that delivers a fan-shaped spray. TETRAKOTE may be applied as the grain is emptied from the combine hopper or at anytime before it is placed in storage.

2. APPLY WITH DOUGLAS TETRAKOTER
(For Commercial and Farm Use)

For faster, easier application use the Douglas TETRAKOTE applicator. This easy-to-use applicator operates under air pressure and therefore requires the use of an air compressor. Spray nozzles may be located on auger grain loaders, conveyor belts or at other prescribed points as grain is put into storage. The TETRAKOTE applicator assures even distribution of protectant over the grain and affords maximum protection.



3. USE TETRAKOTE with the VAC-U-VATOR
(For Commercial Use)

A highly efficient method of applying TETRAKOTE, where large amounts of grain are to be stored or turned, is with the Vac-U-Vator or similar type equipment. Here, the protectant is injected into the pneumatic system of the Vac-U-Vator and is applied to the grain. As the grain passes through the TETRAKOTE spray, the kernels are coated. The TETRAKOTE is injected by means of a small pump which operates from the motor of the Vac-U-Vator.

ON-THE-FARM APPLICATION

Shortly after Douglas developed the formula for TETRAKOTE, Donald A. Wilbur, professor of entomology at Kansas State College, conducted tests in which TETRAKOTE was used on 133 on-the-farm bins in several Kansas counties. The farmers themselves applied the TETRAKOTE to the wheat at the time of harvest. The results of these tests were so encouraging to the farmers, and to Wilbur, that the Douglas Chemical Company was urged to make TETRAKOTE available commercially to the farmer as soon as possible.

Today, more than ever before, farmers know the importance of having clean grain in their storage bins. New government regulations demand that grain used for human consumption be maintained at a high standard of sanitation. That is why Douglas TETRAKOTE is so important to farmers and grain men all across the country. Douglas TETRAKOTE is especially recommended for grains being resealed under the government loan program.

In experimental tests conducted throughout the grain-producing states, grain of all types, treated with Douglas TETRAKOTE, passed the most rigid and exacting tests for sanitation. This new development in grain protection is the answer to a very real problem that is costing farmers millions of dollars in damaged grain every year.

You can recommend TETRAKOTE to the farmer with complete confidence.

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NORTH KANSAS CITY, MO.

Here's Proof that Douglas TETRAKOTE Really Works

CASE HISTORY No. 1

Norris Grain Company

PROBLEM: — To safely store wheat in three 10,000 bushel flat bottom bins that had extremely bad seepage problem. These bins, located at Patridge, Kansas, were practically useless due to infestation of the wheat previously stored in them. The 1952 crop was sold as poultry grain as a result of weevil damage.

SOLUTION: — In 1953, 30,000 bushels of wheat were placed in the bins. At the time the bins were filled, the grain was treated with Douglas TETRAKOTE.

RESULTS: — In February, 1955, the wheat was turned and examined. There were no signs of weevil damage in the grain mass and no live weevils were found.

Norris Grain Co. official says, ". . . you should be congratulated on developing a chemical that not only keeps grain safe but saves the turning and treating cost that we have at other elevators."

CASE HISTORY No. 2

Standard Milling Company

PROBLEM: — To keep 40,000 bushels of wheat stored at the WaKeeney, Kansas, flat storage facilities, free from insect infestation and damage.

SOLUTION: — In the fall of 1952, the grain put into storage was treated with Douglas TETRAKOTE at the rate of 2 gallons per 1,000 bu. TETRAKOTE was applied with a TETRAKOTE Applicator on the leg as it entered storage. Each succeeding year, as new grain was added, the entire grain mass was turned and treated with TETRAKOTE.

RESULTS: — Each year, since 1952, the grain has been inspected. No infestation has appeared in 1953, 1954 or 1955.

CASE HISTORY No. 3

Tamora Cooperative Grain Co.

PROBLEM: — To keep 104,000 bushels of corn free from infestation — primarily from Cadelle Beetles, in storage in Tamora, Nebraska.

SOLUTION: — The corn was treated with Douglas TETRAKOTE as it was moved into Quonset storage by means of a Vac-U-Vator in October, 1954. TETRAKOTE was applied at the rate of 1.9 gallons per 1,000 bu. About 30,000 bushels were of the 1952 crop — the remainder being the 1953 crop. The 1953 crop was infested with Cadelle.

RESULTS: — To date, no live specimens of the Cadelle have been found in the corn.

Company official states, "The relative ease of application, the safety factor in handling, and the long-term protection were among the reasons that influenced our decision to use Douglas TETRAKOTE in the protection of our stored grain."

CASE HISTORY No. 4

Sullivan Grain Co.

PROBLEM: — To keep 180,000 bushels of wheat, stored in concrete tanks at Sullivan, Illinois, free from insect infestation.

SOLUTION: — Thirty days after the wheat was placed in storage, it was turned and treated with Douglas TETRAKOTE. At this time there was evidence of bran bugs — chiefly the Sawtoothed Grain Beetle.

RESULTS: — The grain has been periodically checked — at the top and bottom of the tanks. No live bugs were found at any time. Grain has been shipped out on two occasions without any trouble with insects or off-grading for any reason.

Elevator Manager says, "We think you have found the answer to the problem of insect control in grain. It is both economical and effective..."

CASE HISTORY No. 5

Kansas Wheat Farmer

PROBLEM: — Wooden wheat granary badly infested with Cadelle. Infestation running at a high rate.

SOLUTION: — 3,000 bu. of 1954 wheat were treated with Douglas TETRAKOTE as it flowed from the combine bin into the truck. Wheat was then blown into the granary. A check sample of untreated wheat was placed in a sack and put on top of the treated grain.

RESULTS: — A recent check showed that the *untreated* grain is badly damaged and infested with Cadelle larvae. The treated wheat — stored under identical conditions — showed no signs of damage or infestation.

CASE HISTORY No. 6

Kansas Wheat Farmer

PROBLEM: — To protect 1,550 bushels of wheat from infestation in a wooden granary. The storage facility was in very bad shape — insects had eaten many holes in the lumber. Previous attempts to control infestation had failed — after about 14 days, flour worms would be swarming throughout the grain.

SOLUTION: — Douglas TETRAKOTE was applied to the grain as it went into storage.

RESULTS: — No sign of insect damage or infestation over a prolonged period of time. Complete control over insects.

be very difficult in weighing out a 2-3 gram sample to insure that the correct proportion of larger fragments was present. It is, therefore, necessary to grind the material before weighing out the sub-sample but the grinding must not be too intensive or the figure obtained for fibre content may be too low.

A problem relating to sample size but of a different type which faces the chemist is encountered when the "filth test" has to be performed on some materials. This test, which aims at determining the number of rodent hairs and of insect fragments in a material, involves separating these forms of contamination from the bulk of the sample and then identifying and counting them under a microscope. It is impossible to make a complete separation and hence the filter paper on which the contaminants are collected will contain also some debris from the digested sample. In order to avoid the debris masking hairs and insect fragments, it is necessary with some materials to perform the test on no more than 50 grams of the substance. This is a reasonable size for a sample, particularly if the contamination is uniformly distributed, but a single test on 50 grams would be of little value. A count of nil on such a sample would indicate only that the material contained less than 9 rodent hairs per pound; if the limit were 5 hairs per pound—a limit that has been applied—then from such a result it would be impossible to decide whether the material was or was not acceptable. Obviously, in these circumstances at least two samples of 50 grams must be examined irrespective of how uniform is the contamination.

As a final example of a sampling problem we would turn to the flour/sugar mixtures which were imported in considerable quantities a year or two ago. One use to which these were put was in the preparation of sweetened cake mixes. Their price was related to the sugar content and hence it became necessary to determine the proportion of sugar in each consignment. The material was shipped in bags and the problem, therefore, arose as to how many bags should be sampled. Obviously, if a consignment consisted of 800 bags, it would be impossible to analyze the contents of each of them, but should the number tested be 10, 20, 50? This is but an example of a general sampling problem which has been treated very fully statistically, and in any given instance the proportion of the units to be sampled can be calculated provided certain basic data are available. The problem is a complex one, however, embracing factors such as process average per cent defective, lot tolerance per cent defective, and average outgoing quality limit.

——BREAD IS THE STAFF OF LIFE——

Promising Results Reported from Khapra Beetle Control Test

MIDLAND, MICH.—Promising results for control of the khapra beetle have been reported from a test in California.

Federal and state authorities and experts from industry, in January, 1955, wrapped an entire million-cubic-foot warehouse in gastight covers and, using two and a half tons of methyl bromide fumigant, treated the entire building inside and out, to see if they could eradicate the beetle from an infested storage building. For the test, The Dow Chemical Co. donated a supply of methyl bromide.

Ten days later entomologists examined more than 150,000 insects. All were dead. At the thirty-day mark more than half a million khapra beetles were examined, and all were dead. Absence of young larvae indicated that eggs were probably killed, too.

Authorities are marking time for a 90-day check-up. If it proves satisfactory, it is considered probable that the unique process of wrapping and fumigating entire large buildings will be included under the approved control measure by which premises can be released from federal quarantine restrictions.

Feed Production Executive Analyzes New Developments

The feed manufacturer these days is sometimes facetiously referred to as a "druggist," and some feed men probably figure they have just about earned a degree in pharmacy. This situation, of course, is all part of the increasingly complex nature of feed manufacturing, what with the use in feeds now of minute amounts of drugs, vitamins, synthetic hormones and other substances. But that's just part of the story. There are also such things as increased use of liquid ingredients and, to cut down on labor costs and increase efficiency, more and more automation.

Everyone in the feed manufacturing business is pretty well aware of these various modern developments. But some of them were pointed up

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recently by a feed production man taking a look at industry progress.

Speaking at a meeting in Chicago of the Grain Processing Machinery Manufacturers Assn., Erwin C. Wascher, vice president, Honeggers' & Co., Fairbury, Ill., called attention to some of the recent major developments in feed production and noted their significance in present and future feed plant operations.

Providing a background for his presentation, Mr. Wascher pointed out that the feed industry is continuing at a rapid pace to make the business of feed production more and more complicated. The various new developments, including the use of trace ingredients, add to the dependence put on machines for accuracy in grinding, blending, mixing and weighing. And the increased complexities continually demand more machinery, heavier machinery and more accurate machinery.

None of the progressive milestones in feed manufacturing have called for more manpower, Mr. Wascher noted. Instead, the industry is constantly able to turn out larger volumes with the same or less manpower by the use of new production techniques and equipment.

Taking a close look at feed manufacturing, Mr. Wascher analyzed some of the specific developments which have created and are creating pressures and demands for change. He classified these changes generally as "methods" and "ingredients." And he proceeded to consider five phases of feed manufacturing which are in the process of assuming a new look. They are:

1. The bulk ingredients movement.
2. Increased use of liquids.
3. Automatic proportioning.
4. Fork lift truck as a means of conveyance.
5. Use of corn cobs and other roughages as feed ingredients.

Bulk ingredients—Creating much interest, Mr. Wascher said, is the trend toward raw materials in bulk in covered hopper cars which require only the opening of trap doors to unload the entire contents of a car in just a few minutes. This, he added, can mean increased efficiency, and many ingredients which were often difficult to handle in bulk from box cars—such as salt, calcium, phosphate and alfalfa meal—lend themselves quite readily to this form of shipment.

"However," Mr. Wascher pointed out, "handling of this large volume of unloading and the tremendous surges which it places on raw materials unloading equipment, demand that we consider larger capacity equipment and elevating systems."

Several railroads have expressed an increased interest in this bulk covered hopper car movement, he said.

He continued: "The Wabash Railroad, for example, has reported that covered hopper cars have proven to be the best revenue cars the line has, for a bulk hopper car, as soon as it is empty, moves immediately back for reloading whereas box cars sometimes sit on sidings for several days before being moved for reloading.

"Several other lines, including the Rock Island, Sante Fe and Union Pacific have converted open hopper type coal cars by increasing their size and covering them so that they can be used for such commodities as feed ingredients. With the drop in coal production and consumption, it is understandable that railroads are eager to convert some of the cars standing idle into equipment which will bring them good volume."

Liquids—The use of liquid fat has been a decided asset for the feed manufacturer who has been able to modify his equipment and facilities for its inclusion in feeds, Mr. Wascher said. This is particularly true, he added, because of the dry, low fat and dusty characteristics of many solvent processed ingredients. Benefits of this ingredient in feeds include better texture, less dustiness and high energy. Also, there is more production and less abrasion in pellet mills and other equipment, and a generally cleaner feed plant results. Mr. Wascher said feed plants using liquid fats generally have a cleaner look than previously.

"Of course," he continued, "this milestone is not without problems, such as facilities for receiving and storing liquid fat, extra steam or hot water requirements for keeping the material heated, more intricate blending equipment, and more me-

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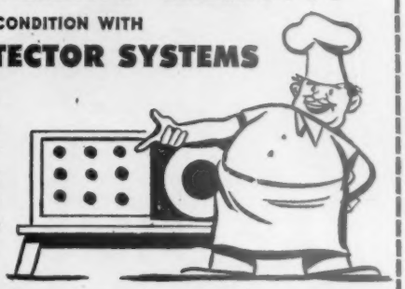

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THE EASIEST AND MOST EFFICIENT MILL FUMIGATION METHOD IN THE WORLD

It is easy! Dawson Fumigant Formula 73 and the "Little Squirt" portable applicator cut your fumigation costs in half and give you better results. It is not impossible. It is being done today in a number of mills. We can prove it, too.

Here's what one miller says: "A complete spot fumigation in our mill takes two men about one hour. Yearly cost is being reduced well below 50% of previous material and methods."

The system is based on a new and efficient portable machine application of a highly concentrated fumigant. No equipment to buy—no initial investment. Two trained men can fumigate a mill in two hours. So effective general fumigations no longer necessary.

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LOW DOSAGE
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Bromotox, a mixture of ethylene dibromide and methyl bromide, is an effective, safe and economical space fumigant. The stronger odor and lower dosage requirements of Bromotox result in greater killing power, increased economy and maximum safety. It is longer lasting, more penetrating and leaves no residual odor. Bromotox allows positive control of granary and rice weevils, Angoumois grain moth, confused flour beetle, Mediterranean flour moth, raisin moth, cheese mites and many other pests infesting grain, flour, rice, cheese and dried fruits. Available in cans packed twelve per case as well as 10, 50, 120 and 170 pound cylinders.
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Methyl Bromide with
2% Chloropicrin

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FERGUSON 21, MISSOURI

ticulous scalping and dressing of the finished feed."

Automatic proportioning — "Certainly a new era is being opened in the method in which raw ingredients are drawn out and assembled for mixing," Mr. Wascher pointed out.

"There are several systems of automatic batching wherein an ingenious arrangement of electronic cells, solenoids, switches and lights takes information fed into a remote control panel and completes a cycle of drawing ingredients, weighing, mixing and discharging; reporting on the progress of each cycle through a system of lights on a control board and signaling any malfunction of machinery.

"These stepchildren of the Navy's Univac are now being installed in some of the most modern feed mills. Variations and improvements of these devices are being built in pilot plants, and others are still on drawing boards. This is a tremendous stride in accuracy control and efficiency."

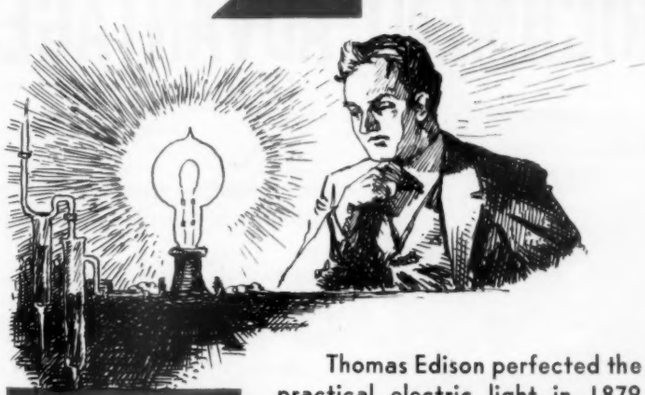
Fork lift trucks—The use of fork lift trucks in handling finished feeds either as an alternative or as an adjunct to belt conveyors and other types of conveying equipment needs no introduction, Mr. Wascher pointed out.

Five years ago fork lift trucks were a rarity in feed mills. Today they are commonplace and have found great usefulness, Mr. Wascher said. The value of the fork lift truck as a means of material handling has been shown not only in the feed industry, but in many other types of manufacturing — almost everywhere where packaged finished goods must be handled and where much of the handling previously was done manually, he noted.

Belt conveyors, he continued, serve a very useful purpose, particularly when feed can be moved direct from

(Continued on page 26a)

THE SCIENTIFIC AGE



THE MIRACLE OF ELECTRIC LIGHT

Thomas Edison perfected the first commercially practical electric light in 1879. Immediately the results of more and better light were felt in industry, the home and the school. It is hard to visualize a world today without electric light and its cousin, electric power.

The touch of a switch at our finger tips brings us light, heat and a million comforts.

In 1879 when the electric light was new, SWISS SILK was an old friend of American millers throughout the country. It was the chief bolting medium of the growing milling industry . . . and today, among the thousands of millers who have inherited the craft traditions of their milling forebears SWISS SILK is tops for sifting, as it has been since the 1830's.

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Low Dosage Space Fumigation

By L. E. McQuillen
Ferguson (Mo.) Fumigants, Inc.

Although many grain mills are controlling the insect problem in mill machinery and equipment through the use of modern effective means of spot fumigation, the need for space fumigation in the warehouse, boxcar, fumigation chamber and under modern plastic film tarpaulins, has in no way been diminished. In this connection space fumigation is used to arrest or prevent the development of insects in the finished mill product.

When space fumigation was primarily used for fumigating the mill building, and the only product involved was the residual mill stock in the machinery and equipment, we didn't need to worry too much about over-dosing, over-exposing, fans for artificial circulation, and other factors which related to minimum exposure of our product to the fumigant vapors. But when the use of space fumigation is for our finished product —packed ready for shipment to our customers—we must give these factors more consideration because we know that a number of fumigants can have some adverse effect upon our product when these important factors of minimum effective dosage, minimum effective exposure periods, and artificial circulation through the use of fans to prevent fumigant stratification are ignored.

Our fumigation of finished product must be more carefully performed under more carefully controlled conditions. We can no longer go on the principle that if a little is good, more is better, and just to be sure, we will give it a double or triple dose. We cannot say that we will try it without a fan, since there is no fan handy, and take the risk of over-exposing a portion of the product and under-exposing the remainder. We must know how to use the minimum dosage for a minimum exposure period with adequate artificial circulation to be sure of a minimum effective exposure of the commodity to the fumigant vapors.

For the past seven years there has been a continuing study of the effective use of mixtures of ethylene dibromide and methyl bromide for space fumigation of cereal products and food products generally, at reduced dosages. The effectiveness of this fumigant combination was first observed in a mill packing room and warehouse area where it gave an apparent 100% insect control under conditions which appeared to be identical to those encountered several months earlier when a much higher dosage of methyl bromide alone had failed to give effective results. Further use of this mixture in mill warehouses throughout that summer season continued to show outstanding results from low dosage application.

During the following winter, a nationally known industrial research laboratory was commissioned to determine by laboratory methods the reason for these superior results in practical application. This laboratory work revealed that the mixture was synergistic, or, in other words, more effective as a fumigant than either of its chemical components. It then became desirable to determine which combination of the two chemicals was most effective and most practical for commercial use. It appears that from the viewpoint of practical application, a relatively high percentage of methyl bromide would be most desirable so as to maintain a high volatility of the mixture for rapid evaporation into space to be fumigated. Various combinations of percentages were tried in practical fumigation, and the results thereof evaluated, both from the standpoint of effectiveness of kill and the convenience of application. It was concluded from these tests that a mixture of 30% ethylene dibromide and 70% methyl bromide, by weight, applied from regular methyl bromide containers, represented the most practical combination from the viewpoint of both effective results and convenience in application.

Dosage

When the most desirable percentage combination had been determined, it was necessary to ascertain the effective dosage under practical fumigation conditions. Although the laboratory work had indicated that it was effective at reduced dosage, the exact reduction in dosage that can be recommended under practical conditions of field fumigations is best determined through trial fumigations under actual field conditions.

Arrangements were made with mills whereby their fumigations would be done at reduced dosage with the understanding that standby gas would be in place and could be released in case the low dosage failed to give effective results in test boxes placed both in the open and buried in the center of packages. Three fourths pound of this fumigant combination was found to regularly give effective results in test boxes, both

(Continued on page 26a)

YOUR CONTROL CHEMISTS APPRECIATE THESE ENRICHMENT ADVANTAGES

Control chemists recognize these points of superiority in MERCK VITAMIN MIXTURES:

1. **Uniformly light in color.**
2. **All ingredients are so finely divided and thoroughly mixed that uniform distribution can be attained in every pound of flour.**
3. **Flow readily and feed easily in the customary feeders.**

Because of these advantages MERCK VITAMIN MIXTURES are preferred by so many quality control people in the industry. *And remember:* Enrichment adds a potent plus at the point of sale.

MERCK VITAMIN MIXTURES

For Flour Enrichment

Research and Production for the Nation's Health

MERCK & CO., INC.
Manufacturing Chemists
RAHWAY, NEW JERSEY

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MAINTENANCE

(Continued from page 1a)

chinery and in our decisions for replacements.

After these policies were established, we developed the preventive maintenance program that I am about to describe. Please note that we tried to keep our system just as simple as possible. We believe we have accomplished that aim, and we sincerely believe that if we have erred, it will be because of over-simplification rather than because our system is too complicated.

Our system makes use of a number of cards for our records.

(See the accompanying illustrations.)

Unit Record Card

First card is called the "unit record card." All "unit record cards" are kept in a central location. Each item of maintenance on a particular machine unit is posted on this card. In posting each item, we note in detail just what work was done on this machine.

If this work was caused as a result of an inspection through our preventive maintenance system, we put the initials "P.M." after the description so we know that the work was done because of a preventive maintenance inspection. If the work done on this machine was caused through a breakdown of the machine, we put the initials "B.D." after the description, so we know the work was done after a breakdown of the machine.

Posted on these cards will be all of the money spent on this machine after its installation, and from these cards we can tell just how much maintenance money is spent on this unit, so we will know when it is to our advantage to replace a machine. These cards contain the history of a machine unit. These cards are kept accurate and up to date by a clerk called the "preventive maintenance clerk" whose primary job is to keep all the records. These unit record cards are filed by departments within any particular plant.

Each machine in our plants had previously been assigned a number by our accounting department. We use the same unit numbers. This is one of the instances where we fit our program into a program previously used in our company by our accounting and insurance departments.

Inspection Date Cards

After the "unit record cards" are made out for a given department, the department manager and the manager of the mechanical department decide how many times each year each of the units should be inspected. They start with the premise that every machine should be inspected at least once each year but may be inspected oftener if they feel the need. According to their decision, "Inspection date cards" are written, indicating which machine should be inspected during each month. Where a machine is to be inspected twice a year, two of the inspection date cards are made up, and where a machine is inspected four times a year, four of the inspection date cards are made up.

Keeping each department separate, these date cards are divided up into the 12 months of the year so that each month has approximately the same number of inspections for that department to make. Machines being inspected twice a year have inspections separated by intervals of six months, and those machines that are to be inspected four times a year have inspections separated by intervals of three months. Preceding the first of each month, the preventive maintenance clerk will pull out all the "inspection date cards" for that particular month, and from them he will make out an "inspection order" for each card.

Our "inspection order" is made up of two sheets with a carbon paper between.

On the first of the month the preven-

THE QUAKER OATS COMPANY - _____ PLANT - MONTH OF _____

REPORT OF PREVENTIVE MAINTENANCE INSPECTIONS AND BREAKDOWNS	INSPECTIONS SCHEDULED	INSPECTIONS COMPLETED	INSPECTIONS INCOMPLETE	CRITICAL POINTS FOUND	JOBS RESULTING	JOBS COMPLETED	BREAKDOWNS	REMARKS AND ESTIMATED PRODUCTION HOURS SAVED BY INSPECTION

The Quaker Oats Company—INSPECTION ORDER

INSPECTION OF UNIT_____

LOCATION_____ FL._____

DATE INSPECTED_____ INSPECTOR_____

DEPT. MANAGER_____

FORM 4613

The Quaker Oats Company DATE_____

DAILY RUNNING INSPECTION.

DEPT._____ OPERATOR_____

UNIT No._____ FL._____

REMARKS: _____

Form 4608

EXTRA! Big News!

for everyone with a Pest Problem!

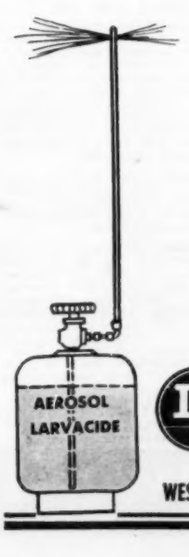
Now LARVACIDE in aerosol form is being applied in mill and storage space with instant gasification!

With AEROSOL Larvacide, it takes less time to fumigate, less time to aerate — and you get the wellknown LARVACIDE kill: insects, egglife, larvae — rodents too, without carcass nuisance. Rats are driven out of retreats, die on the open floor where they're easily swept up.

AEROSOL Larvacide is released under pressure by simply opening a valve. The gas travels up to 50 feet in five or six seconds. Penetrates mill machinery, cracks and sacked goods. Gets into those remote retreats where pests may find refuge from fumigants less potent.

Look into AEROSOL Larvacide today. See how much quicker and how much more easily it does the job you want.

Liquid LARVACIDE is still available, in cylinders of 50, 100, 180 and 250 lbs. net, and those handy 1 lb. dispenser bottles, each in sealed can.



Write for YOUR GUIDE to Effective and Safer Mill Fumigation

Larvacide Products, Inc.

117 Liberty Street, New York 6, N. Y.

WEST COAST OFFICE—1515 Third Street, San Francisco 7, Calif.

The Quaker Oats Company BREAKDOWN REPORT

DATE_____

UNIT NO._____ DEPT._____ FL._____

DESCRIPTION:_____

LAST INSPECTION_____

HOURS LOST_____ PRODUCTION LOST_____

REMARKS:_____

FORM 4611 REV. 1-54

The Quaker Oats Company LUBRICATION REPORT

DATE_____

UNIT. NO._____ DEPT._____ FL._____

	OIL LINE BROKEN		OIL PUMP LEAKING		CANNOT LUBRICATE
	EXCESSIVE OIL		PUMP NOT OPERATING		FITTINGS PLUGGED
	FITTINGS MISSING		BEARING LEAKING		BEARING HOT
	BEARING VIBRATING		BEARING NOISY		RINGS NOT TURNING
	DISCOLORATION OF LUBRICANT				

DATE REPAIRED_____ DEPT. MGR._____

LUBRICATOR_____

Form 4612 - Rev. 1-54

tive maintenance clerk will send all of the "inspection orders" for that particular month to the department manager, and it is the responsibility of that department manager to see that these inspections are made during the month for which the cards are issued.

The department manager may make these inspections himself, or one of his assistants may do so. If he feels that no one in his department is competent to make this inspection, he may request help from the mechanical department; however, the responsibility for making this inspection rests entirely with that department manager.

If the inspector finds nothing wrong with the machine, he will mark it "O.K." on the inspection order. If, however, he notes that something is out of order, he will write his comments and suggestions on this "inspection order."

After the inspection has been made, all the "inspection orders" are returned to the department manager of that department. Again it is the responsibility of the department manager to decide whether or not he wishes to have the things done as noted on the inspection order by the inspectors.

The department manager may go back to a machine where it has been noted a gear is worn and decide that gear could continue to run until the next inspection period. In that case he would note alongside the inspection order that he has seen this gear and prefers not to have it replaced at this time. If, however, he wishes to replace this gear, he would write a job sheet to his maintenance department, requesting the change of this gear, and would initial the job sheet with the initials "P.M." indicating that it showed up on a preventive maintenance inspection and that the replacement of that gear should be done before the end of the month. After an inspection is completed, the department manager retains the duplicate of the "inspection order," for his own file. He returns the original to the Preventive Maintenance clerk, who dates that inspection on the "inspection date card," and returns the "inspection date card" to the file so that it will come up in this same month in the following year.

If we could be sure after inspecting a machine that it would run continuously until its next inspection, this would be all that would be necessary in a preventive maintenance program. However, we found that machines could be inspected very conscientiously on one day, and the next day things could develop that need to be taken care of immediately in order to prevent serious trouble in that machine.

Daily Running Report

Therefore, we have a form called a "daily running inspection report." Each operator, whether he be a man running one particular machine or a miller running several machines, carries a pad of these daily running inspection reports. If, during this particular shift nothing occurs on any of the machines to indicate they would not continue to run and perform their function, then it is not necessary for him to turn in one of these daily running inspection reports; but if anything develops on any machine for which he is responsible, he should make out one of these reports indicating where that machine is not functioning properly.

A "daily running inspection report" gives us continuous inspection of machines between our regular scheduled inspection periods.

Breakdown Card

The fifth form we use is the "breakdown card." Whenever a breakdown occurs, a breakdown card

Economical conversion saves space and maintenance costs

THE 'PNEU-SPOUT' SYSTEM for FLOUR and FEED

VERSATILE
NEAT APPEARANCE
HYGIENIC AND
CHOKE-PROOF

Stocks now held in U.S.A.

See how this Purifier floor gained light and efficiency by changing over to 'Pneu-Spout'.

To Robinsons of England goes credit for 'Pneu-Spout' — the simplest, most economic metal spouting system. Non-corroding, aluminum "use-again" units are easily erected in **any** required position — thanks to their "lobster-backed" design which enables bends of all degrees and directions to be made on the spot. Cast iron units are supplied for the smut department.

'Pneu-Spout,' too, is freer from chokes . . . more readily accessible for cleaning. The units are firm and rigid, without "dead spots" or linings to conceal infestation.

Ready-to-assemble 'Pneu-Spout' can be put together by an unskilled worker using only screwdriver, hacksaw and file. And it goes up four times faster than any other metal spouting system. No large stocks of angle tubes or bends are required. No complicated joinery or fitting is needed on site. 'Pneu-Spout' gives **definite** saves in time, material, labor and maintenance.

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LET DOTY DO IT
IF YOUR LAB IS OVERLOADED
Sanitation Analyses - Wheat and Flour
Doty Technical Laboratories
KANSAS CITY 13, MO.

PAPER SACKS FOR MILLERS
The Chatfield & Woods Sack Co.
CINCINNATI, O.

Need New Rolls?

In addition to our roll corrugating and grinding service for the flour milling industry, the Twin City Machine Co. also supplies new rolls, and we will be pleased to receive your inquiries.

TWIN CITY MACHINE CO.
Roll Corrugating and Grinding New Rolls
527 Second Avenue, S.E. Minneapolis, Minn.

is made out by the department manager. When the work is done, the "breakdown card" is given to the preventive maintenance clerk to post the proper entry on the "unit record card" to record the cost of that breakdown.

When breakdowns on a particular unit occur regularly between inspection of that unit, it is an indication to us that the unit should be inspected more often, and this adjustment is made on the inspection dates.

"We also have a "lubrication report." A pad of those reports is carried by each of our oilers, and when anything occurs during his rounds, he will make out this lubrication report to indicate the unit and the cause of trouble. He turns this "lubrication report" in to his department manager, who corrects the trouble as quickly as possible.

Monthly Report

We have a monthly maintenance report to management and department managers. This is a monthly report that gives us a summary of how the preventive maintenance program is working. Copies of this report go to the department manager, the management of that particular mill, the manager of the maintenance department, and to the central engineering and planning department in Chicago. It is through these reports that we can observe the success or failure of our preventive maintenance system.

It will show whether or not our maintenance department is doing its part on the preventive maintenance program. If the preventive maintenance people are doing their part, they will complete just as many jobs as there are jobs resulting from inspections. If they are falling down on their part of this program, it will be so indicated on this report.

We started to install this system in our mills about a year ago, and we have been expanding steadily ever since. At this time we cannot give you any dollar indication of how much this system is worth to our company, but we do have a few incidents that have occurred since that time which may indicate the value of a program such as this.

Experience With Program

Recently we received a report from our Cedar Rapids plant concerning the preventive maintenance program in the feed department. I would like to quote from this letter:

"When we originated this program, there was some concern over the fact that the main inspections and repair jobs necessary to put the plant into proper shape would greatly increase for a time our feed department repair costs. We are quite surprised to find that this has not been the case.

"It is also interesting to note that after the first four months the program was in effect, the number of departmental breakdowns took a decided drop. We of course, realize that loss due to breakdown ties in directly with the amount of tonnage produced. If the tonnage is low, there is more available time for repair, and breakdown should also be minimized. However, in July our feed tonnage was 5,400 tons, and we had 12 breakdowns. In August with more tonnage — 5,900 tons — we had only four breakdowns. In September, with over 7,000 tons, we had four breakdowns only. In October with 5,800 tons, we had only one breakdown. This, of course, has cut down the figure for feed lost where at the beginning of this year it was regular to lose up to 90 tons of feed per month through the breakdowns. It is interesting to note that in September we lost only 14 tons. This reduction has been very steady each month.

"Of interest also is the fact that our man hours devoted to preventive maintenance inspections and some repair by the personnel of the feed department itself have been greatly reduced since the program went into effect. In May the feed department personnel put in 247 hours on inspections. This figure has dropped month by month until September only 23 hours were necessary for inspection.

"Another slant on our over-all repair cost and reduction is the fact that where we still get almost as many job sheets as we did in the past, the jobs themselves are minor and take less time and material.

"We are most encouraged with the results of our first survey and feel that we are definitely on the right track toward cutting our over-all plant repair bill."

New Feed Plant

SPRINGFIELD, ILL.—The framework of the Illinois Farm Supply Co. feed plant near here has been completed. The plant, which will cost an estimated $1,500,000, will also include a warehouse, garage and office building, according to Will Brooks.

A. E. BAXTER ENGINEERING CO.
Designers and Engineers for Mills, Elevators and Feed Mills
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A rugged, ready - to - use, high - knockdown, quick-killing CONTACT SPRAY. Contains synergized allethrin and pyrethrins in deodorized base oil.

Useful where proximity of grain, cereals, flour or other food products makes use of toxic residual sprays inadvisable.

Also successful for prevention or early control of Indian meal moth infestations on bin tops and other grain surfaces. Kills moths and exposed worms.

Binsecta-Cide
Weevil-Cide Bin Spray

A safer RESIDUAL SPRAY - CONCENTRATE—with added CONTACT value. Contains 20% methoxychlor, plus synergized allethrin, for 1-to-7 dilution with water (or base oil)—a powerful, honest dilution that will give you real results.

For elevator, flat storage and farm bins; for accessible areas in grain elevators, flour and feed mills and cereal processing plants.

Can be safely used to spray areas over open-top bins of grain. Residue has extremely low toxicity to man or animals.

—and the prices are low! ! Compare them.

Contacta-Cide (Contact Spray)		Binsecta-Cide (Residual spray-concentrate)	
53-gal. drums	$1.80 per gal.	53-gal. lined drums	$5.55 per gal.
5-gal. drums	1.95 per gal.	5-gal. lined drums	5.70 per gal.
Cases 1-gal. cans (6 to case)	2.20 per gal.	Cases 1-gal. cans (6 to case)	5.95 per gal.
1-gal. cans (packed singly)	2.25 per gal.	1-gal. cans (packed singly)	6.00 per gal.
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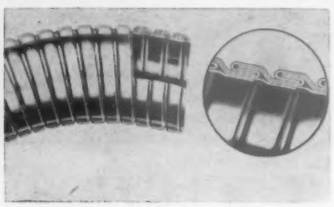
This reader service department announces the development of new and improved products, new services and new literature offered by manufacturers and suppliers. Claims made in this department are those of the firm concerned. Use the accompanying coupon to obtain the desired information.

No. 5129—Proportioning System

A proportioning system that permits remote dialing of individual ingredient weights is pictured and described in a new, 28-page, two-color bulletin offered by Richardson Scale Co. Besides describing how Richardson's Select-O-Weigh system works, the bulletin details 11 installations in various operations, including blending of feeds. Forty-seven photographs and engineering drawings illustrate these installations. In addition, design and operating characteristics of the firm's automatic proportioning system are explained. For copies of bulletin 0351, check No. 5129 on the coupon and mail it.

No. 5153—Conveyor

A new flexible metal hose, especially designed for use in conveying materials having abrasive and corrosive characteristics such as grains and bulk chemicals has been announced by the Universal Metal Hose Co. Two types are available—U-100-L standard weight (.015 in. galvanized steel strip) and U-120-L heavy-duty (.020 in. galvanized strip). Both types are furnished with .012 in. stainless steel strip liner, unless a carbon liner will satisfy and is specified. Six standard sizes (3, 4,



5, 6, 7 and 8 in. I.D.) are available in both types. Other sizes may be had on special order. For more complete details check No. 5153 on the coupon and mail it.

No. 5130—Packaging

Bemis Bro. Bag Co. has prepared a new folder titled "Packaging for Sales in Polyethylene" which is available to readers. The folder lists the physical qualities and characteristics of polyethylene, its advantages as a sales and protective package, and describes various types of polyethylene bag constructions that are available. To secure the folder check No. 5130 on the coupon and mail it.

No. 5151—Metal Detector

A description of what the A-C electronic metal detector is and what it does are told in a new bulletin released by the Allis-Chalmers Manufacturing Co. The bulletin also tells how the detector is built and how it works to provide electronic inspection. The detector is easy to install and adapts readily to production line use, the bulletin points out. A copy of the bulletin may be secured by checking No. 5151 on the coupon and dropping it in the mail.

No. 6212—Bag Handling

Arkell & Smiths is offering a 10-page bulletin on "Palletizing Filled Multiwall Bags." Based on laboratory tests and field checks, and complete with detailed drawings, the bulletin contains useful ideas and suggestions to facilitate handling, shipping, and adapting bags now being used, to fit a given pallet. Copies of the bulletin may be obtained by marking No. 6212 on the coupon.

No. 5154—Space Fumigant

Eston Chemicals Division, American Potash and Chemical Corp., have jointly announced their new folder on Bromotox, a new space fumigant composition. It is a mixture of methyl bromide and ethylene dibromide that is under pressure in the container and is applied in the same manner as commonly practiced with methyl bromide alone. The product is claimed to be synergistic, and completely effective at dosages 25% or more below that commonly used for methyl bromide. The product has a strong odor which is valuable in safe application by permitting the fumigator to easily detect the fumigant in very low concentrations. No odor residue has been experienced in tests. The fumigant is nonflammable. For more complete details check No. 5154 on the coupon and mail it.

No. 5132—Level Control

Scrayco has announced a flow control instrument that is said to control dry and wetted materials under inflammable and explosive conditions. Called an explosion-proof model of the Scrayco level control, the switch is Underwriters' Laboratory approved.

Send me information on the items marked:

- ☐ No. 5090—Lift Truck Operation
- ☐ No. 5094—Bagging Scale
- ☐ No. 5120—Door Puller
- ☐ No. 5129—Proportioning System
- ☐ No. 5130—Packaging
- ☐ No. 5132—Level Control
- ☐ No. 5145—Filling Machine
- ☐ No. 5146—Temperature System
- ☐ No. 5151—Metal Detector
- ☐ No. 5153—Conveyor
- ☐ No. 5154—Space Fumigant
- ☐ No. 6212—Bag Handling

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The answer to your dust problem, too, may be the new Air Centrifuge!

I want you to know of the excellent results we are obtaining with the Superior Air Centrifuge which you installed for us some time ago.

Our problem was to recover an extremely fine vegetable dust (more than 90% passes through a 200 mesh screen) which was escaping our cyclone collectors, and was venting to the outside as a loss. Two cyclone collectors are used in connection with a pair of hammer mills which grind our product. Our over-all loss in grinding was from 2% to nearly 5%.

Our present installation uses a Superior Air Centrifuge in connection with a single hammer mill and cyclone and has resulted in the following benefits for us:

1. Cut former over-all loss in grinding by 50% or more.
2. Such complete recovery of the dust formerly vented to the outside that the air may now be discharged within the room with resultant heat saving in winter.
3. Increased operating efficiency so that the per mill output increased 50%.
4. Effected a desired particle separation by collecting the recovered fine dust separately.

Our experience with the Superior Air Centrifuge, as a means of helping to solve our dust problem and in reducing costs, has been very favorable, and I unhesitatingly recommend that anyone who has a dust problem contact your company for help in solving such a problem.

Yours very truly,

MC LAUGHLIN GORMLEY KING COMPANY

Dail C. LaCraft
y

Dail C. LaCraft
Factory Manager

WRITE TODAY!
We'll be happy to furnish complete information. If you wish, a Superior representative will call to help with your problem.

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Also available is a new flexible sphere to seal Scrayco control units that is adaptable to extremes of industrial process temperatures. To secure more complete details check No. 5132 on the coupon, clip and mail it.

No. 5146—Temperature System

The PTC Cable Co. temperature indicating system and how it provides protection against grain spoilage is described in words and pictures in a new, 8-page, color booklet. Function of the PTC system from the moment thermocouple circuit detects heat in grain and transmits temperature to indicating instruments is explained. The manufacturer offers a 5-year guarantee on this system. To secure the booklet check No. 5146 on the coupon and mail it to this publication.

No. 5120—Door Puller

A portable, light weight box car door puller has been introduced recently by the Lug-All Co. Designated as model HDR-27, the puller has a reach of 27 ft. and total pulling capacity of 3,000 lb., according to the

manufacturer. The company states it may be rigged by single cable for extra long reach or double cable to provide extra power on "tough" box car doors. An eye bolt and clevis hook combination permits right angle anchorage on box car projections. For more details check No. 5120 on the coupon and drop it in the mail.

No. 5094—Bagging Scale

The Richardson Scale Co. offers a product data sheet on its improved GGG-38 bagging scale. This mechanically-operated weighing unit has been equipped with a synchronized belt feeder and a pneumatic inlet-gate assist, both of which enable it to operate faster, handle lumpy materials and weigh down to 25 lb., it is claimed. Besides a detailed description of the scale, the data sheet includes lists of seven specifications and five features. Included also are a photograph of the unit and a dimensioned engineering drawing. To secure this data sheet check No. 5094 on the coupon and mail it to this publication.

No. 5145—Filling Machine

The Kraft Bag Corp. is now marketing an automatic open mouth filling machine capable of 22 to 24 one-hundred pound charges a minute, with one man hanging bags, using standard size and standard type open mouth bags. The machine requires no head of material to maintain accuracy. The machine can handle all weights from 25 lb. to 200 lb., with an average variance of not more than 8 oz. plus or minus under ordinary production conditions during a full day's operation, it is claimed. To secure more complete details check No. 5145 on the coupon and drop it in the mail.

No. 5090—Lift Truck Operation

The sixth printing of the booklet, "How to Operate a Lift Truck," has been completed by the Hyster Co. and the 24-page publication is now available again free to lift truck operators and users. The two-color cartoon technique used in the booklet is designed for easy reading. Information about the operation of a lift truck, preventive maintenance, safety and basic materials handling are included. Secure the booklet by checking No. 5090 on the coupon and dropping it in the mail.

—BREAD IS THE STAFF OF LIFE—

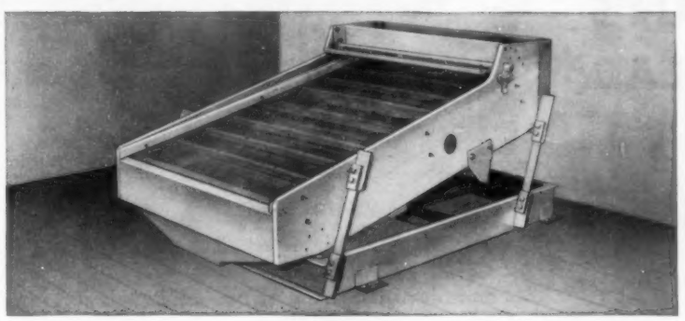
NEBRASKA BLAZE

STEELE CITY, NEB.—The Paul S. Clark & Sons elevator here, which had a 15,000-bu. capacity, burned recently. Considerable feed and concentrates as well as stored grain burned, according to Mr. Clark.

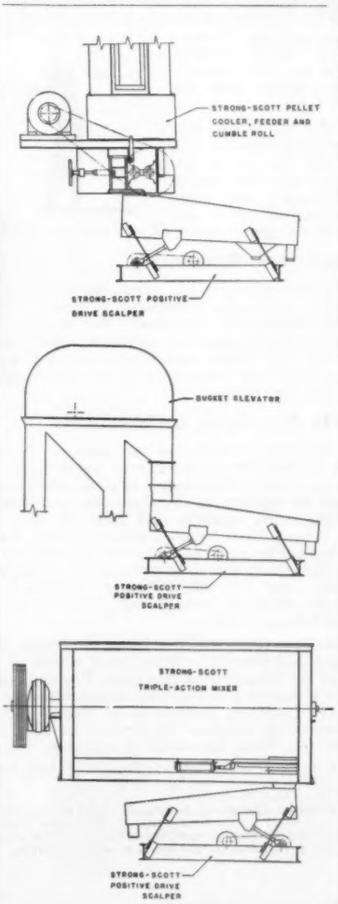
Advertisement

NEW PRODUCT NEWS

NEWLY DESIGNED POWER-FLO SCALPER ASSURES HIGHER CAPACITY AND A SUPERIOR END PRODUCT!



Reduced Dimensions Allow Complete Versatility!!


STRONG-SCOTT PELLET COOLER, FEEDER AND CUMBLE ROLL
STRONG-SCOTT POSITIVE DRIVE SCALPER
BUCKET ELEVATOR
STRONG-SCOTT POSITIVE DRIVE SCALPER
STRONG-SCOTT TRIPLE-ACTION MIXER
STRONG-SCOTT POSITIVE DRIVE SCALPER

The overall reduction in the height of the new Power-Flo Reciprocating Scalper allows versatility in installation and increased capacity. The counter-balanced eccentric drive affords smooth, quiet operation even under the most critical installation conditions. Whether a single screen or double screen is used the new Positive Drive Power-Flo Scalper assures higher capacity and more uniform production than other types of similar design.

Single Screen Capacity

On single screen scalpers the capacity of rough scalping through ½" x ¾" perforated metal screen is 500 bushels per hour per foot of width when scalping whole grains.

Double Screen Capacity

On double screen scalpers the capacity of rough scalping through ½" x ¾" perforations on top screen and 4/64" perforated bottom screen is 500 bushels per hour per foot of width of screen when scalping whole grains.

Pellet Crumble Sizing

On the Strong-Scott Special Crumble Scalpers the capacity obtained sizing pellet crumbles over a 5-mesh top screen and a 16-mesh bottom screen is 6000 pounds per hour per foot of width sizing crumbles weighing 40 pounds per cubic foot. With this type of operation a superior crumble end product is obtained.

The
STRONG-SCOTT
MFG. CO.
451 Taft Street N. E.
MINNEAPOLIS 13, MINN.

Strong-Scott Power-Flo Scalper Requires Less Headroom—Makes the Installation Easier!

Development of an all new scalper, called the Power-Flo, has just been announced by the Strong-Scott Mfg. Co. of Minneapolis. Revolutionary in design, the new Model P54 Power-Flo Scalper requires less headroom, making installation infinitely easier.

Power-Flo Construction

Standard construction is steel with the exception of the wood shoe. The biggest and newest construction feature is the eccentric drive which is counter-balanced—maintaining vibration at a minimum. The Power-Flo Scalper is also available in a complete steel model at a slightly higher cost.

R. R. Strong, chairman of the New Product Development Committee at the Strong-Scott Mfg. Co., said: "This new Power-Flo scalper incorporates an agitating flow principle coupled with a positive eccentric counter balanced drive. The combination of these new features has greatly improved the overall capacity and performance as compared with previous designs."

R. R. Strong

Eccentric Counter-Balanced Drive

A high speed reciprocating motion is transmitted to the screen bed through a unique eccentric counter-balanced drive. This ball-bearing mounted eccentric is counter-balanced to maintain vibration at a minimum. The hopper is fitted with an adjustable gate to control the flow of the grain to the screen. Materials too coarse to pass through the openings in the screen are carried over the tail.

Motor and Drive Included with Unit

One of the biggest advantages of this new Positive Drive Reciprocating Scalper is that a motor and V-belt drive, ready for installation on a 220-440 volt, 3 phase, 60 cycle line, is included with the unit. So the assembly is complete, except for the screens, to facilitate installation and reduce power-costs. The biggest single advantage, however, is the reduced overall dimensions which solve space problem installations.

NEW DEVELOPMENTS

(Continued from page 19a)

bagging lines to outbound cars or trucks. But, he added, in the type of feed business which calls for many different formulas and different forms, it has been found that a fork lift system is an efficient method of operation.

Corn cobs and roughages—Coarse, low cost and low quality roughages such as corn cobs need some consideration in thinking about trends in the feed business, Mr. Wascher said.

"Corn cobs, for example, may never be handled in commercial feed mills where large production is involved because of huge storage facilities which would be required and because special crushing and screening machinery would be needed," he said.

"We should, however, realize that our nutrition and research people have made a major contribution in the science of animal feeding in finding the true value of the lowly corn cob for livestock feed.

"The next few years of experience will show whether corn cobs and other roughage will be processed at the feed manufacturer level or on the farm. But in either case, someone is going to sell machinery for this process, and the commercial feed industry will at least supply the supplements and concentrates necessary for mixing with the low cost roughages to make balanced rations for farm animals."

In this connection, Mr. Wascher noted that the University of Illinois, in cooperation with power companies, has been working with automatic grinding and proportioning equipment which allow the farmer to preset grinding equipment to draw corn, oats, roughages and supplement from bins and then go about his farm work, thus being freed from considerable labor.

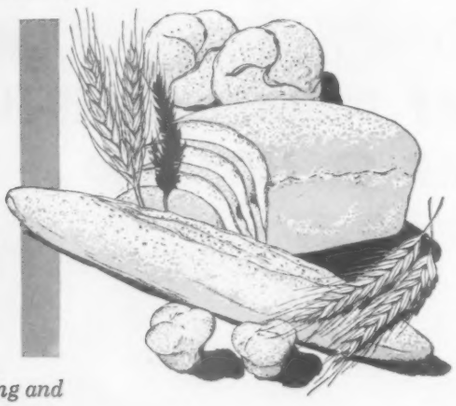
While discussing several new developments in feed manufacturing, Mr. Wascher also pointed out that "electronic equipment is not going to make people obsolete."

Industry will always need machine operators, supervisors, skilled mechanics and machinists to watch over the more and more complex machinery and equipment. These machines will never run completely by themselves, although the more complex machinery becomes, the more ability it will have to take over all manual labor.

"This means," Mr. Wascher said, "that we have a responsibility to provide people who are better qualified and more skilled in their fields to watch over these machines, to see that these mechanical monsters we have created continue to perform with the high degree of efficiency and accuracy for which they were designed, purchased and installed in our feed plants."

Advertisement

FLOUR FOR MAN'S BREAD*

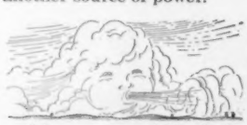


A Brief History of Milling and Baking by SCIENCE WRITER

CHAPTER VII. *The Winds and the Mills.*

NEW POWER SOURCE

New centers of production and trade grew up in the interior of Europe during the decline of the Roman empire. And they grew at sources of water power. Lands which did not have falling water, no matter how well located for trade, could not compete successfully. It was necessary that they find another source of power.



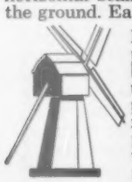
In the Low Countries of Europe, which are swept by westerly winds that blow fairly steadily but not destructively, windmills were developed to meet the need. These mills supplied power for production and for pumps which drained the flat and fertile lands.

PROBLEMS OVERCOME

Windmills were developed approximately a thousand years after watermills, according to recorded history. The experience gained in harnessing the force of water helped in solving problems in using the winds. Consider what some of these were. A means of turning the mill's sails to face the wind was needed. A fairly constant rate of work-speed was required no matter what the velocity of the wind. The power drive came from above instead of below as generally used in watermills, with a re-arrangement of the millstones necessary. A counter balance to the weight of sails and sail wheel was needed. Needless to say these problems were met successfully.

TYPES OF MILLS

The earliest known types of windmills had the sails set in a fixed tower. These were used in the Middle East. In Europe a more efficient type of mill was developed. It had vertical sails and could be turned into the wind. This was the post mill in which the entire building was carried on a heavy horizontal beam which was pivoted on a strong post set in the ground. Early mills probably used a stump as the post.



Later, mills were developed in which the supporting post ran through the height of the building for greater stability. A variation of this type was the hollow-post mill in which power from the sails was transmitted to the millstones by a shaft running through the post. Then came the cap mill in which only the top of the mill was turned to face the sails into the wind.

Turning the mill into the wind was a considerable problem. Tail poles were used at first by which the miller pushed or pulled the mill into position. Human power gave way to mechanical power in which a winch was used. Finally a fan-tail arrangement was developed which used the wind to turn the mill cap.

Better balance of the sail wheel was achieved by slanting it backward at a slight angle. And distribution of the cap's load came through the use of metal roller bearings in a ring cage. After much experimentation sails and rigging were developed to get greatest effect from the wind.

WHERE ARE THEY NOW?

Milling was carried on whenever the winds blew—day or night. The mills were profitable ventures. The winds still blow. Why, then, did windmills disappear? Because large mills need steady power for continuous operation, there can be no dependence on the winds, which are intermittent. Steady steam power displaced the windmills so that today they are only graceful curiosities.

IMPORTANT VALUES RESTORED

Just as medieval millwrights overcame problems, so have today's millers and bakers. As the science of nutrition developed within recent years it was found that white bread and flour, demanded by consumers for their fine qualities, unavoidably lost important vitamin and mineral values during processing. When these losses became known the baking and milling industries acted to overcome the deficiencies by adopting enrichment. A simple process, enrichment restores to white bread and flour the valuable vitamins B_1 and B_2, niacin and the mineral, iron. Result: better nutrition which can mean better health.

This is one of a series of articles which is being published in professional nutrition and dietetic journals, and which will be widely distributed for educational purposes. Reprints of this and all previous chapters are available without charge. Write to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

The next chapter titled: "European Millwrights" will be published soon.

*This is the title of a definitive history of milling by John Storck and Walter Dorwin Teague, published by the University of Minnesota Press at Minneapolis and copyrighted by the University of Minnesota. It is used with permission as a source of material for this series of advertisements.

Enriched with vitamins and iron for better nutrition

SPACE FUMIGATION

(Continued from page 20a)

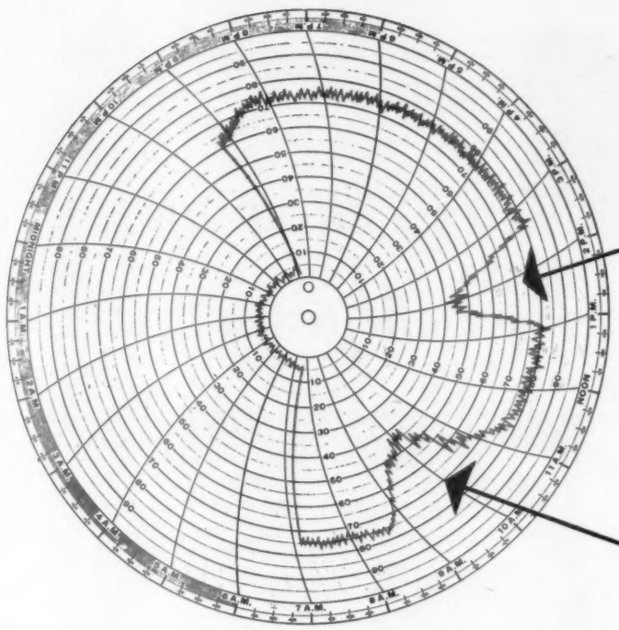
exposed and buried deep in the packages in any structure of reasonable construction and reasonably well sealed.

Since ¾ lb. per 1,000 cu. ft. had regularly given effective results in flour warehouse fumigation, a trial was run at ½ lb. per 1,000 cu. ft. This large brick building was of good construction, from a fumigation point of view, and well suited to effective space fumigation. For artificial circulation, one fan was used with each fifty or one hundred pound cylinder of gas, and was allowed to run about 30 minutes after the gas had been released. Twenty-two hours after the gas had been released, the building was entered by two operators wearing gas masks, and many test boxes from varying locations were recovered and brought out for examination. One hundred per cent of all insects in test boxes were dead, and the building was aerated and re-examined after aeration was complete, without a single live insect specimen being found either in test boxes or in existing natural infestation. It had been definitely determined that the fumigant combination was effective at greatly reduced dosages.

Strong Odor

An advantage to this fumigant combination observed in connection with these extensive practical trial fumigations was its strong and distinctive odor. At fumigation concentrations, it was positively obnoxious and irritating to the eyes, so that it might be expected to repel unauthorized entry into the building being fumigated. At very low concentrations, it was easily detected by odor.

It has been determined by both laboratory and practical fumigation tests that a mixture of 30% ethylene dibromide and 70% methyl bromide, by weight, is effective at reduced dosage for the fumigation of packaged and bagged flour. Penetration in all instances has been complete. Practical fumigation trials have shown that the strong odor of the fumigant is an important factor in relation to safe handling and application.



these mean trouble...

IT MIGHT BE a broken belt, a torn sieve, or a choke-up somewhere in the spouting.

But... no matter *what* causes the flow variation in the flour stream ... it's spotted the INSTANT it happens. One look at the graphic recorder operated from the W&T Massometer or Merchen Scale Meter tells the story. Even the smallest momentary fluctuations in flow rate are detected immediately and recorded accurately by these mill "watch dogs."

W&T Massometers and Merchen Scale Meters provide a continuous record — *by weight* — of actual mill performance. They tell you the *exact* flow rate of your streams and they pinpoint time and production losses.

Guaranteed to 1% accuracy, the Massometer will handle flour flows up to 200 pounds per minute... the Merchen Scale Meter, up to 600 pounds per minute. For other applications the Meter will handle flows up to 3000 pounds per minute. Both instruments have been tested and proved highly dependable in hundreds of installations throughout the country.

For complete information, write us today or communicate with your nearest W&T representative.

Massometer

Merchen Scale Meter

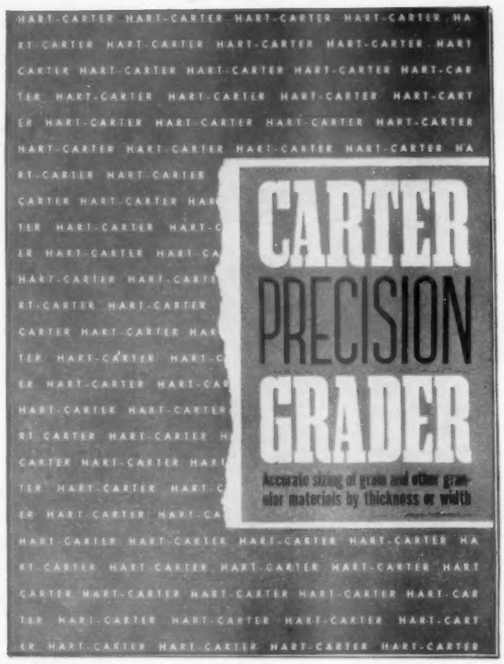
WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

M-29

THESE FOLDERS *will show you how Hart-Carter machines work*

This folder gives you the basic facts about Hart-Carter machines for separating and sizing granular materials by *length* differences. It describes Carter Disc Separators, which separate by means of pocketed discs; and Hart Uni-Flow Indented Cylinder Separators. Ask for folder L1.



This companion folder describes the operating principles of Carter Precision Graders, which separate and size by *thickness* or by *width* differences. Cylinder shells with slotted perforations separate by thickness. Shells with round recessed perforations separate by width. Ask for Folder CPG-2.

HART-CARTER COMPANY

673 19TH AVENUE N. E. MINNEAPOLIS 18, MINNESOTA

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Please send me:

☐ Folder L1, Length Separation and Sizing
☐ Folder CPG-2 Width and Thickness Separation and Sizing

*Name*_____

*Firm*_____

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